

# Worksheet 5

Math 1572H, 21 March 2006

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**1. Taylor polynomials** Find the Taylor polynomial of degree 3 about  $x = 0$  for the function  $f(x) = \ln(\sin(x + \pi/2))$ .

**2. Booyah** Find the Taylor polynomial of degree 3 about  $x = 0$  for the function  $g(x) = \sqrt{1+x}$ .

**3. Expected value and variance of a random variable** The expected value of a (discrete) random variable  $X$  is given by the formula

$$E[X] = \sum_n nP(X = n).$$

The variance of a random variable  $X$  is given by the formula

$$V[X] = E[X^2] - (E[X])^2.$$

Typically, one uses the standard deviation (the square root of the variance) to measure the spread of a random variable.

3a. If  $X$  is a geometric random variable with parameter  $q$ , then

$$P(X = n) = \begin{cases} q^{n-1}(1 - q) & \text{for } n \geq 1 \\ 0 & \text{for } n \leq 0. \end{cases}$$

Find the expected value and the variance of a geometric random variable with parameter  $q$ .

3b. If  $Y$  is a Poisson random variable with parameter  $\lambda$ , then

$$P(Y = n) = \begin{cases} \frac{\lambda^n e^{-\lambda}}{n!} & \text{for } n \geq 0 \\ 0 & \text{for } n < 0 \end{cases}$$

Find the expected value and variance of a Poisson random variable with parameter  $\lambda$ .